

ANESTHESIOLOGY

Motor Vehicle Crash Risk among Adults Undergoing General Surgery: A Retrospective Case-crossover Study

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EDITOR'S PERSPECTIVE

What We Already Know about This Topic

- There are limited data to guide return to driving recommendations for patients undergoing surgery
- It remains unclear whether patients have an increased risk of motor vehicle crashes in the first few weeks after surgery compared to before surgery

What This Article Tells Us That Is New

- In a cohort of 70,722 drivers in New Jersey undergoing inpatient or outpatient general surgery and discharged to home, the number of crashes in the 4 weeks after surgery (263, 0.37%) was similar to the number of crashes over a 4-week period before surgery (279, 0.39%)
- Consistent with nonsurgical populations, specific demographic groups were at higher risk of a crash after surgery

Driving is an essential activity for many Americans—greater than 228 million hold a valid driver's license, and greater than 85% use a car as their primary mode of transportation.¹ The ability to drive can increase independence and well-being across the lifespan, yet few other

ABSTRACT

Background: Surgery causes transient impairment in cognition and function, which may impact driving safety. The authors hypothesized that the risk of a motor vehicle crash would increase after compared to before surgery.

Methods: The authors performed a nested case-crossover study within population-based observational data from the New Jersey Safety Health Outcomes Data Warehouse. The study included adults 18 yr or older with a valid driver's license who underwent general surgery in an acute care hospital in New Jersey between January 1, 2016, and November 30, 2017, and were discharged home. Individuals served as their own controls within a pre-surgery interval (56 days to 28 days before surgery) and postsurgery interval (discharge through 28 days after surgery). General surgery was defined by Common Procedural Terminology Codes. The primary outcome was a police-reported motor vehicle crash.

Results: In a cohort of 70,722 drivers, the number of crashes after surgery was 263 (0.37%) compared to 279 (0.39%) before surgery. Surgery was not associated with a change in crash incidence greater than 28 days using a case-crossover design (adjusted incidence rate ratio, 0.92; 95% CI, 0.78 to 1.09; $P = 0.340$). Statistical interaction was present for sex and hospital length of stay. Younger *versus* older adults (adjusted risk ratio, 1.87; 95% CI, 1.10 to 3.18; $P = 0.021$) and non-Hispanic Black individuals (adjusted risk ratio, 1.96; 95% CI, 1.33 to 2.88; $P = 0.001$) and Hispanic individuals (adjusted risk ratio, 1.38; 95% CI, 1.00 to 1.91; $P = 0.047$) *versus* non-Hispanic White individuals had a greater risk of a crash after surgery.

Conclusions: Using population-based crash and hospital discharge data, the incidence of motor vehicle crashes over a 28-day period did not change on average before compared to after surgery. The authors provide data on crash risk after surgery and highlight specific populations at risk.

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activities are as dangerous as driving.² In 2020, greater than 5 million motor vehicle crashes occurred in the United States, resulting in 1.6 million injuries and nearly 36,000 deaths.³

Surgery and anesthesia transiently impair cognitive and functional domains that are known to be critical for safe driving.^{4,5} Several prominent organizations have labeled surgery as a potential impediment to safe driving, yet empirical evidence on the extent and duration of such driving risk immediately after surgery is lacking.^{6–8} Unfortunately, research on the association between surgery and driving has

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not sufficiently addressed this knowledge gap. A previous study found that simulated driving performance returns to normal 24 h after knee arthroscopy under general anesthesia.⁹ Regarding crash risk, no change in risk was found in the 3 yr after bariatric surgery, and a decreased risk was found in the 6 yr after cataract surgery.^{10,11} However, these studies focus on whether surgeries that treat specific health conditions (e.g., morbid obesity, poor eyesight) may alter the increased risk of crashes due to these conditions over a long time frame and do not address the risk attributable to surgery itself. Thus, we know little about short-term driving risk in adult patients undergoing surgery.

Given both the importance of safely encouraging driving independence and the potential for crashes, we conducted a large retrospective observational study using statewide data from New Jersey to compare crash incidence before and after general surgery procedures and to define the timing of such crashes after surgery, overall and within demographic and clinical subgroups. We hypothesized that crash incidence would increase after surgery compared to before surgery and that older adults, those with a longer hospital length of stay, non-Hispanic Black individuals, and males would have an increased incidence of crashes. Our results will provide data on crash risk after surgery for patients, their families, providers, and hospitals.

Materials and Methods

Study Population

We used data from the New Jersey Safety and Health Outcomes Data Warehouse, a population-based data warehouse that linked statewide police-reported crash reports, state driver licensing information, and hospital discharge information from the New Jersey Discharge Data Collection System. The data linkage was highly reliable. The median match probability of a true match was 0.999.¹¹ The false match rate was 0.006. Hospital discharge data comprises utilization data from acute care hospitals in New Jersey and is derived from hospital uniform billing information. Full details of the development of the warehouse are available in a previous paper.¹² We identified general surgery procedures defined by Common Procedural Terminology Codes (see table, Supplemental Digital Content 1, <https://links.lww.com/ALN/D111>, listing all surgical procedures included in the study) that had a hospital admission date from January 1, 2016, through November 30, 2017.¹³ Same-day surgeries were included if performed in an acute care hospital and the encounter had the same admission and discharge date. We then selected individuals 18 yr or older who were discharged to home and held a valid New Jersey driver's license at the time of hospital admission. Most individuals had only one procedure during admission (96.0%). When individuals had multiple admissions with a general surgery procedure during the study period, we included only the first admission.

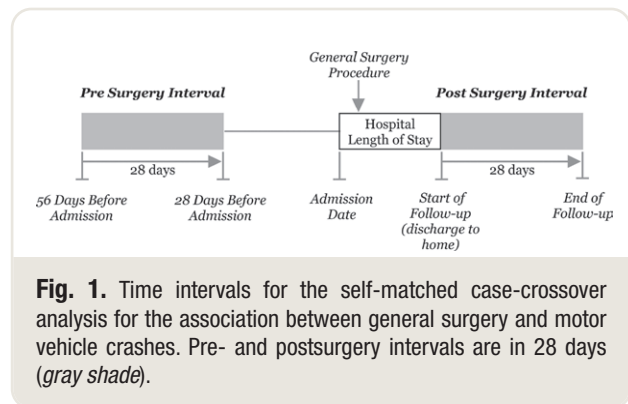


Fig. 1. Time intervals for the self-matched case-crossover analysis for the association between general surgery and motor vehicle crashes. Pre- and postsurgery intervals are in 28 days (gray shade).

The study was approved by the University of Pennsylvania (Philadelphia, Pennsylvania) and Children's Hospital of Philadelphia (Philadelphia, Pennsylvania) Institutional Review Boards, who also waived the requirement for participant informed consent. The article was prepared following the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines.¹⁴ A data analysis and statistical plan was written, date-stamped, and recorded in the investigators' files before data were accessed.

Study Design

The two primary aims of the study were to assess (1) whether surgery was associated with a change in the incidence of crashes among all surgical patients and within four potentially high-risk subgroups and (2) the timing of crashes after surgery. To account for potential patient-level factors that could confound the association between surgery and crash risk, we used a case-crossover design in which each individual serves as their own control within different time intervals (i.e., a self-matching design).¹⁵ A self-matching design controls for confounding of exposure-outcome relationships by accounting for both measured and unmeasured time-invariant factors within individuals. We selected two distinct 28-day time intervals, as shown in figure 1: (1) a presurgery interval from 56 to 28 days before admission and (2) a postsurgery interval that began with the discharge date and continued for 28 days. The presurgery interval was chosen to avoid potential underestimation of baseline crash rate given that some indications for surgery may reduce driving exposure (e.g., number of driving trips, miles driven) in the days immediately before surgery.

Outcomes and Covariates

The primary outcome of interest was driver involvement in a police-reported motor vehicle crash. In New Jersey, crashes are reportable when they result in injury or more than \$500 property damage. We obtained information on covariates through linked data sources included in the New Jersey Safety and Health Outcomes Data Warehouse. Crash characteristics included single *versus* multiple vehicle

involvement, responsibility of the driver, and the day of the week of the crash. Demographic characteristics included age in years at the time of admission (18 to 34, 35 to 54, 55 to 70, more than 70), sex (male, female), race or ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic other), marital status at the time of admission (never married, currently married, previously married), neighborhood median household income, and population density. Age groups were chosen to align with Centers for Disease Control and Prevention (Atlanta, Georgia) cut-offs.¹⁶ Race or ethnicity was defined using self-reported values within all records in the linked data warehouse. Census tract information of the driver's residential address was used to define neighborhood median household income and population density.¹⁷ Selection of comorbidities was based on associations with crashes in the general population and defined using International Classification of Diseases, Ninth Revision–Clinical Modification and International Classification of Diseases, Tenth Revision–Clinical Modification codes from Elixhauser algorithms.^{18,19} Comorbidities were ascertained from hospital discharge data up to 180 days before the index surgery and included the admission for surgery. Procedure characteristics include surgery-specific risk (low, intermediate, high or emergency) and hospital length of stay in days as a binary variable (less than 1, 1 or greater).²⁰ Finally, hospital readmissions and deaths were captured within the postsurgery interval from hospital discharge records and the complete data warehouse (including death certificates), respectively.

Power and Sample Size Calculation

Our power calculation was based on Dupont's sample size formula, adopted for case-crossover studies.²¹ From our pilot data, the number of crashes in New Jersey occurring in a 28-day period was estimated to be 33 events per 10,000 drivers. Assuming minimal correlation in exposure between intervals, we have greater than 80% power to detect at least a 25% change in the incidence of crashes across surgery with a sample size of 70,722 individuals.

Statistical Analysis

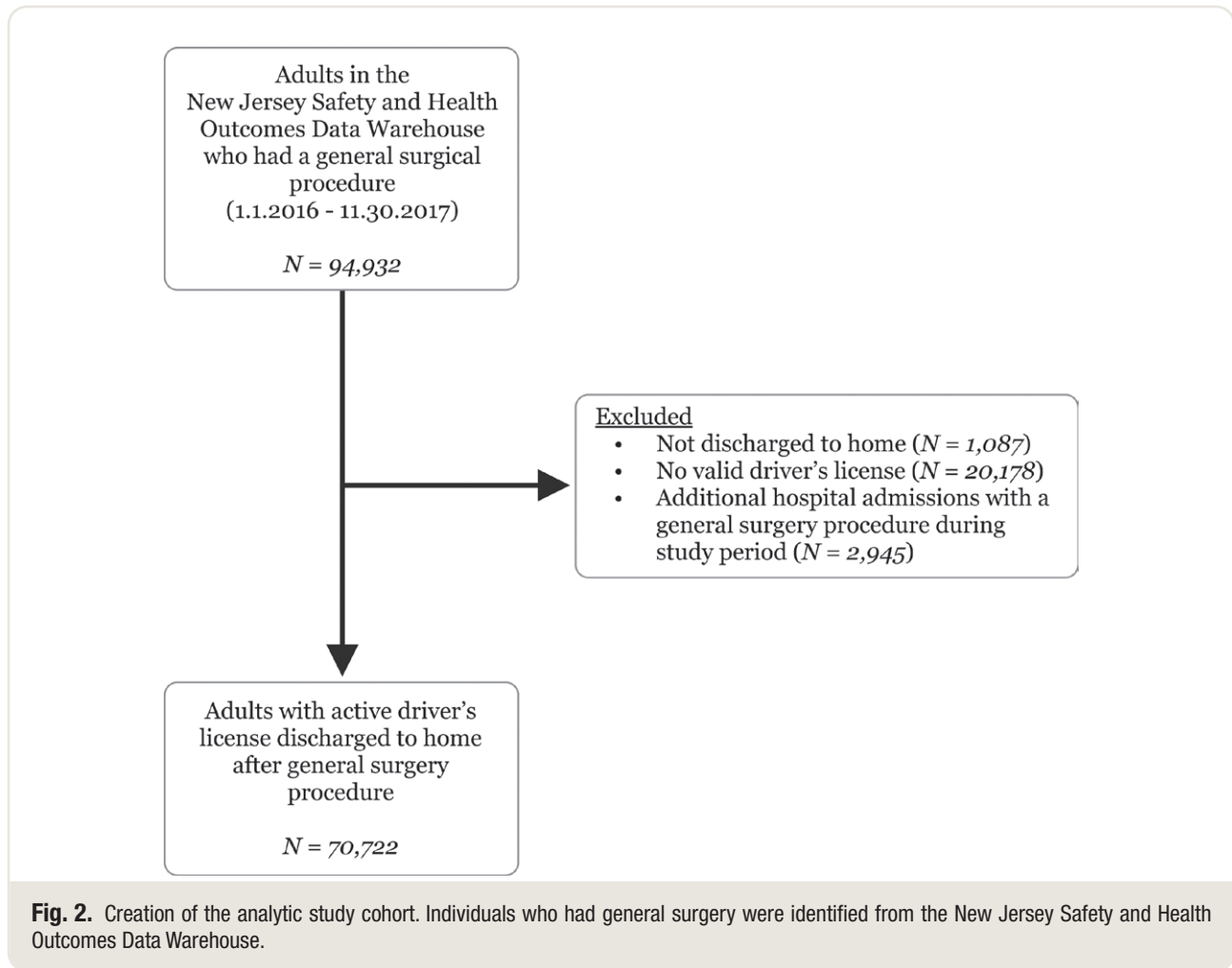
We described the baseline characteristics of the study cohort using medians with interquartile ranges for continuous variables and counts with proportions for categorical variables. Given that missing data were present in only race or ethnicity (0.28%) and population density (0.02%), we used a complete case analysis. Next, we quantified the number and frequency of crashes in each 28-day presurgery and postsurgery interval. Differences were compared using McNemar's test. We then estimated adjusted incidence rate ratios with 95% CI, comparing the postsurgery interval to the presurgery interval using conditional Poisson regression models.²² We adjusted for the month of year and day of week of the start date of

each interval (presurgery and postsurgery) as time-variant factors to account for seasonal and daily variation in crash risk. The day of the week was defined as a seven-level categorical variable. We also conducted stratified analyses for the following subgroups: age, racial or ethnic group, sex, and hospital length of stay. Groups were selected due to known associations with crash risk in the general population and postsurgical complications and impairment.^{4,23–28} Moreover, we hypothesized that hospital length of stay would be key to driving risk, as driving guidance is often absent from inpatient discharge summaries.²⁹ Surgery-specific risk was assessed as an additional covariate in a *post hoc* analysis. Adjusted incidence rate ratios and 95% CIs were reported for each subgroup stratum. We tested for interaction on the multiplicative scale by including in the conditional Poisson regression model an interaction term between the risk period (presurgery, postsurgery) and each covariate.³⁰

Sensitivity analyses of our baseline model were performed including (1) individuals who had complete follow-up time and (2) appendectomies, given that appendicitis occurs suddenly and at random, and thus it is not likely to affect driving behavior in the presurgery interval. We conducted a third sensitivity analysis with a technique called quasi-induced exposure that analyzes only nonresponsible drivers from clean, multiple vehicle crashes.³¹ Briefly, in a multiple vehicle crash, the nonresponsible driver is assumed to be involved in the crash at random and thus represents the general driving population and their driving exposure at the time and space of the crash.³² This method allows us to obtain relative estimates of crash involvement adjusted for driving exposure given that the number of usual driving trips, driving distance, or driving time may change postsurgery.

We calculated and visualized the incidence rate of crashes before and after surgery within the full population (in 2-day intervals) and within categories of age, race or ethnicity, sex, and length of stay (in 4-day intervals). Individuals were censored due to a crash, death, inpatient readmission, loss of license, or after 28 days. Finally, using the full cohort of individuals who had general surgery, we then compared the risk of a crash in the 28 days after surgery by demographic and clinical subgroups. Since few drivers were censored before 28 days postsurgery, we estimated adjusted risk ratios and 95% CIs using multivariable binomial regression. The model was adjusted for variables associated with motor vehicle crashes and/or postsurgery impairments in addition to the length of stay and procedure risk.^{25,33–36} The variables include age, race or ethnicity, sex, marital status, previous crash (56 to 28 days before admission), neighborhood population density, the total count of comorbidities, and admission month and day of the week.

Analyses and figures were performed in STATA 15.0 (StataCorp LLC, USA) and GraphPad Prism version 9.0.0 (GraphPad Software, USA). A two-sided α of 0.05 was used to denote statistical significance.



Results

Our study sample included 70,722 licensed drivers who had general surgery from January 1, 2016, through November 30, 2017, and were discharged home. Figure 2 displays the creation of our study cohort from the New Jersey Safety and Health Outcomes Data Warehouse. Baseline characteristics of our cohort are shown in table 1; median age was 55 yr, 28,569 (40.4%) were male, 5,124 (7.2%) were non-Hispanic Black, and 15,444 (21.8%) had a hospital length of stay of 1 day or more. In the 28 days after discharge, 20 (less than 0.1%) individuals died, and 1,584 (2.2%) had an inpatient admission. Hernia repair (33.1%) was the most common general surgical procedure in our cohort.

A total of 263 crashes (0.37%, $n = 70,722$) occurred in the 28 days after discharge after general surgery. In comparison, 279 crashes (0.39%, $n = 70,722$) occurred during the presurgery interval ($P = 0.490$). No individuals had a crash in both intervals, and none had more than one crash. Among reported crashes, there was no difference between the interval after surgery and the interval before surgery in the proportion of crashes with multiple vehicle involvement

(92.4% vs. 90.7%, $P = 0.474$) or driver responsibility (43.4% vs. 44.4%, $P = 0.797$). Having general surgery did not change the risk of crashes (adjusted incidence rate ratio, 0.92; 95% CI, 0.78 to 1.09; $P = 0.340$). In sensitivity analyses, crash risk did not change when the analysis was restricted to cases with complete follow-up (adjusted incidence rate ratio, 0.96; 95% CI, 0.81 to 1.14; $P = 0.667$). The adjusted incidence rate ratio for patients undergoing appendectomy was 1.41 (95% CI, 0.84 to 2.39; $P = 0.197$) and may have been underpowered to detect a statistically significant difference. Finally, we found similar estimates using the quasi-induced exposure method (adjusted incidence rate ratio, 0.99; 95% CI, 0.77 to 1.27; $P = 0.954$), suggesting that any potential changes in driving exposure postsurgery are unlikely to explain our results.

In stratified analyses of the case-crossover design (table 2), we identified interaction on the multiplicative scale by sex (adjusted incidence rate ratio, 0.70; 95% CI, 0.50 to 0.99; $P = 0.048$) and hospital length of stay (adjusted incidence rate ratio, 1.53; 95% CI, 1.01 to 2.29; $P = 0.041$). Crash incidence after surgery compared to before surgery was lower in male drivers (adjusted incidence rate ratio, 0.75; 95% CI, 0.58 to 0.99; $P =$

Table 1. Baseline Characteristics of 70,722 Adult Drivers Undergoing General Surgical Procedures in New Jersey from 2016 to 2017

Variable	N (%) or Median (Interquartile Range)
Age, yr	55 (42–66)
18–34	10,363 (14.7)
35–54	24,102 (34.1)
55–70	24,231 (34.3)
> 70	12,026 (17.0)
Sex	
Female	42,153 (59.6)
Male	28,569 (40.4)
Race/ethnicity	
Non-Hispanic White	47,766 (67.5)
Non-Hispanic Black	5,124 (7.2)
Non-Hispanic other	5,158 (7.6)
Hispanic	12,475 (17.6)
Marital status	
Never married	17,379 (24.6)
Currently married	43,168 (61.0)
Previously married	10,175 (14.4)
Neighborhood population density (people/square mile)	3,012 (1,205–6,111)
Neighborhood median household income (dollars)	83,095 (62,500–108,571)
Comorbidities	
Hypertension	25,384 (35.9)
Obesity	9,796 (13.9)
Diabetes	8,479 (12.0)
Chronic obstructive pulmonary disease	7,850 (11.1)
Depression	4,024 (5.7)
Arrhythmia	3,962 (5.6)
Apnea	2,496 (3.5)
Valvular disease	1,708 (2.4)
Congestive heart failure	1,292 (1.8)
Renal failure	1,266 (1.8)
Other neurologic disorders	911 (1.3)
Alcohol abuse	802 (1.3)
Drug abuse	457 (0.65)
Alzheimer's and related dementias	213 (0.3)
Emergency Surgery Status	7,264 (10.3)
Hospital length of stay (days)	
< 1	55,278 (78.2)
≥ 1	15,444 (21.8)

0.040) in contrast to female drivers (adjusted incidence rate ratio, 1.07; 95% CI, 0.86 to 1.34; $P = 0.537$). Crash incidence after surgery compared to before surgery was higher in drivers who had a hospital length of stay 1 day or more (adjusted incidence rate ratio, 1.29; 95% CI, 0.90 to 1.84; $P = 0.166$) in contrast to drivers who had a hospital length of stay less than 1 day (adjusted incidence rate ratio, 0.84; 95% CI, 0.69 to 1.01; $P = 0.077$). For procedure risk, crash incidence did not differ for low-risk (adjusted incidence rate ratio, 0.84; 95% CI, 0.63 to 1.12; $P = 0.233$), intermediate-risk (adjusted incidence rate ratio, 1.01; 95% CI, 0.79 to 1.28; $P = 0.949$), or high-risk procedures (including emergency surgery; adjusted incidence rate ratio, 0.67; 95% CI, 0.36 to 1.24; $P = 0.199$).

Figure 3 displays the incidence rate of crashes per 10,000 driver-days in the presurgery and postsurgery intervals for the full cohort (2-day interval) and *a priori*-defined subgroups (4-day interval). The incidence of crashes after surgery was lower in the first week (adjusted incidence rate ratio, 0.46; 95% CI, 0.29 to 0.74; $P = 0.001$) and similar from 8 to 28 days (adjusted incidence rate ratio, 1.05; 95% CI, 0.87 to 1.27; $P = 0.601$) when compared to the presurgery interval.

From multivariable regression using the full cohort, we found the adjusted risk of experiencing a crash in the 28 days after discharge to be greater in non-Hispanic Black individuals (adjusted risk ratio, 1.96; 95% CI, 1.33 to 2.88; $P = 0.001$) and Hispanic individuals (adjusted risk ratio, 1.38; 95% CI, 1.00 to 1.91; $P = 0.047$) compared to non-Hispanic White individuals. Similarly, the risk of experiencing a crash after surgery was greater in adults aged 18 to 34 yr compared to adults older than 70 yr (adjusted risk ratio, 1.87; 95% CI, 1.10 to 3.18; $P = 0.021$). The adjusted crash risk after surgery did not differ in males compared to females (adjusted risk ratio, 1.02; 95% CI, 0.79 to 1.32; $P = 0.890$) and for hospital length of stay 1 day or more *versus* less than 1 day (adjusted risk ratio, 1.29; 95% CI, 0.96 to 1.72; $P = 0.091$; see table, Supplemental Digital Content 2 (<https://links.lww.com/ALN/D112>, listing the full regression model).

Discussion

Among a large cohort undergoing general surgery in New Jersey, crash incidence after surgery was not different from the incidence before surgery when using a case-crossover analysis. However, the association between surgery and car crashes differed by sex and hospital length of stay. The risk of a crash after surgery was higher in younger *versus* older age groups and in non-Hispanic Black and Hispanic individuals than non-Hispanic White individuals.

Car crashes are a leading cause of injury and death in the United States.³ Previous research has mainly focused on the effects of chronic medical conditions on driving risk, with data lacking overall on the influence of acute conditions such as surgery on driving.⁶ Of concern, surgery, along with anesthesia, is increasingly associated with cognitive and functional impairment after hospital discharge and may transiently and adversely impact tasks critical to driving safely.^{5,36} However, research on the association between surgery and driving has been limited to case reports, driving simulation, and long-term risk assessment in specific surgical populations.^{9–11,37} Not surprisingly, clinicians feel uncomfortable providing advice about driving and infrequently discuss driving with patients.^{38,39} Moreover, guidance on medical fitness to drive in the United States is inconsistent.⁴⁰

Reassuringly, we found that having general surgery did not change the incidence of crashes on average within

Table 2. Total Number of Motor Vehicle Crashes, Crash Frequency, and Adjusted Incidence Rate Ratio (with 95% CI) Comparing Postsurgery to Presurgery Intervals for All Drivers and by Select Characteristics

Characteristic	Presurgery Interval		Postsurgery Interval		Adjusted Incidence Rate Ratio (95% CI)*
	Total No. of Crashes	Frequency, % (total N)	Total No. of Crashes	Frequency, % (total N)	
Full cohort	279	0.39 (70,722)	263	0.37 (70,722)	0.92 (0.78–1.09)
Age, yr					
18–34	52	0.50 (10,363)	69	0.67 (10,363)	1.14 (0.76–1.69)†
35–54	116	0.48 (24,102)	100	0.41 (24,102)	0.85 (0.65–1.11)
55–70	77	0.32 (24,231)	69	0.28 (24,231)	0.90 (0.65–1.25)
> 70	34	0.28 (12,026)	25	0.21 (12,026)	0.61 (0.35–1.08)
Sex					
Female	152	0.36 (42,153)	166	0.39 (42,153)	1.07 (0.86–1.34)‡
Male	127	0.44 (28,569)	97	0.34 (28,569)	0.75 (0.58–0.99)
Race/ethnicity					
Non-Hispanic White	169	0.35 (47,766)	146	0.31 (47,766)	0.85 (0.68–1.08)§
Non-Hispanic Black	19	0.37 (5,124)	35	0.68 (5,124)	1.26 (0.67–2.38)
Hispanic	74	0.59 (12,475)	63	0.51 (12,475)	0.86 (0.61–1.21)
Hospital length of stay, days					
< 1	223	0.40 (55,278)	187	0.34 (55,278)	0.84 (0.69–1.01)
≥ 1	56	0.36 (15,444)	76	0.49 (15,444)	1.29 (0.91–1.84)

*Adjusted for each interval start date (month and day of week). †Measure of interaction on the multiplicative scale for age groups: adjusted incidence rate ratio, 0.85; 95% CI, 0.71 to 1.02; $P = 0.087$. ‡Measure of interaction on the multiplicative scale for sex: adjusted incidence rate ratio, 0.70; 95% CI, 0.50 to 0.99; $P = 0.048$. §Measure of interaction on the multiplicative scale for race/ethnicity: adjusted incidence rate ratio, 1.06; 95% CI, 0.90 to 1.25; $P = 0.482$. ||Measure of interaction on the multiplicative scale for hospital length of stay: adjusted incidence rate ratio, 1.53; 95% CI, 1.01 to 2.29; $P = 0.041$.

adults in our cohort. We used a case-crossover design that controls for measured and unmeasured confounding from time-invariant variables and has been used in previous research on acute exposures and crashes.^{41,42} Concerns about the safety of driving after surgery have been expressed by several national organizations, including the National Highway Traffic Safety Administration (Washington, D.C.), American Geriatrics Society (New York, New York), and American Medical Association (Chicago, Illinois), yet have never been validated using crash data.^{6–8} Our findings suggest that given current surgical patient driving behaviors and provider recommendations, a general surgery event does not, on average, manifest in immediate changes in driving safety. Moreover, the null result from our quasi-induced exposure analysis suggests crash incidence before and after surgery is unlikely to be attributed to differences in relative driving exposure, a surrogate for actual driving mileage. Future studies that capture driving patterns and mileage can help elucidate how surgery influences driving behavior and risk in more detail. Finally, we identified that the incidence of crashes after discharge was not constant and was lowest in the first week and returned to presurgery levels thereafter.

Within groups, we identified that sex and hospital length of stay modified the association between surgery and crashes. Men have a higher incidence of postoperative complications than women, which may alter their driving behavior after discharge, warranting further investigation.²⁴ Differences in crash incidence by hospital

length of stay highlight a need to evaluate driving safety after all types of surgery, not just ambulatory surgery. Unfortunately, inpatient discharge summaries typically do not contain information on driving safety.²⁹ In contrast, crash incidence before *versus* after surgery remained largely unchanged within groups of age, race or ethnicity, and surgery-specific risk. Nonetheless, we identified differences in the crash risk after surgery between groups using multivariable regression analysis that overall mirror crash risk within the general population. Younger adults had a higher risk of a crash after surgery compared to older age groups. Risk also varied across race and ethnicity, in line with recent evidence that minority communities are disproportionately represented in car crashes.²⁷ Thus, the perioperative setting may present an opportunity to promote safe driving practices in general.

Limitations

A primary limitation of this study is that we did not directly measure driving exposure (e.g., driving trips, miles driven) during the pre- and postsurgery intervals. However, our study design purposively selected surgical procedures for which driving would be more likely to occur after discharge and used a quasi-induced exposure method to account for relative driving exposure. While we used a case-crossover design to control for confounding, there may still be residual confounding from factors that vary before *versus* after surgery, such as the level of pain and the amount of prescribed pain medications.

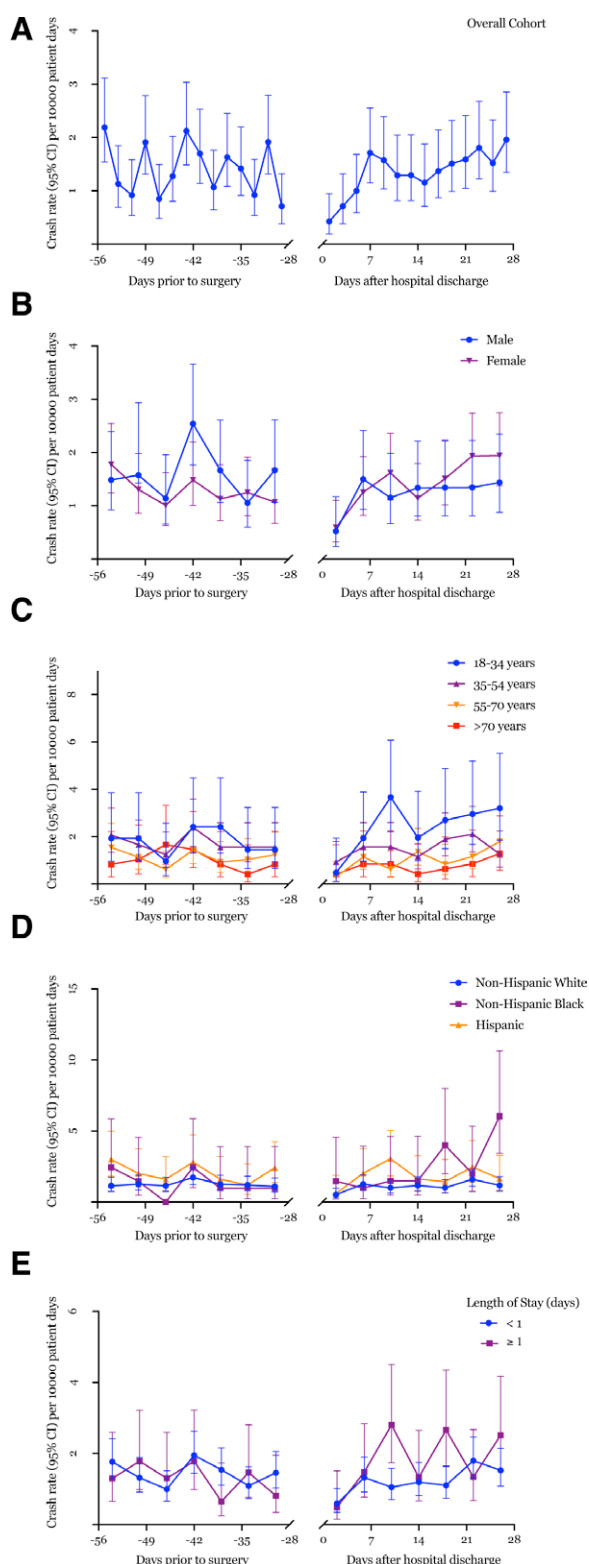


Fig. 3. Incidence rate of motor vehicle crashes after surgery per 10,000 driver-days. Overall (A) and within groups of sex (B), age (C), race or ethnicity (D), and hospital length of stay (E). Incidence rates are shown for 2-day averages for the overall cohort and 4-day averages for each subgroup.

Moreover, New Jersey Safety and Health Outcomes does not capture medication and intraoperative data, limiting evaluation of how perioperative clinical management may influence driving risk. Last, there may be limits to generalizability. Only surgeries performed in acute care hospitals were captured in the dataset. New Jersey is the most densely populated state in the United States, and results may not be applicable to states with different geographic makeup.

Conclusions

In this retrospective, case-crossover study, general surgery was not associated with a change in the incidence of car crashes but differs by sex and hospital length of stay. Our results provide crash incidence data on motor vehicle crash risk after surgery.

Research Support

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Competing Interests

Dr. Curry received a speaker honorarium from the Association for Driver Rehabilitation Specialists (Hickory, North Carolina) and Drive Smart Virginia (Richmond, Virginia). The other authors declare no competing interests.

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Supplemental Digital Content

Supplemental Digital Content 1, Table: <https://links.lww.com/ALN/D111>

Supplemental Digital Content 2, Table: <https://links.lww.com/ALN/D112>

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